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Patent Department

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:
MARK T. STARR
UNISYS WAY, MS/E8-114
BLUE BELL, PA 19424-001

NOTIFICATION OF TRANSMITTAL OF
INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Date of Mailing (*day/month/year*)	

Applicant's or agent's file reference	IMPORTANT NOTIFICATION
USYS-0160/TN333C 10/888000	

International application No.	International filing date (*day/month/year*)	Priority date (*day/month/year*)
PCT/US2004/33527	07 October 2004 (07.10.2004)	08 October 2003 (08.10.2003)

Applicant .

UNISYS CORPORATION

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

   The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

   Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

   For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US	Authorized officer
Mail Stop PCT, Attn: IPEA/ US	
Commissioner for Patents	CHARLES RONES
P.O. Box 1450	
Alexandria, Virginia 22313-1450	Telephone No. (571) 272-3609
Facsimile No. (571) 273-3201	

Form PCT/IPEA/416 (July 1992)

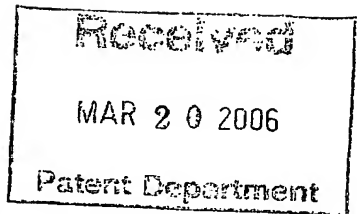# PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To: MARK T. STARR UNISYS WAY, MS/E8-114 BLUE BELL, PA 19424-001	**PCT** NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Rule 71.1)

Date of Mailing (day/month/year) **17 MAR 2006**

Applicant's or agent's file reference USYS-0160/TN333C	**IMPORTANT NOTIFICATION**

International application No. PCT/US2004/33527	International filing date (day/month/year) 07 October 2004 (07.10.2004)	Priority date (day/month/year) 08 October 2003 (08.10.2003)

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	CHARLES RONES
	
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Form PCT/IPEA/416 (July 1992)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference USYS-0160/TN333C	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US2004/33527	International filing date *(day/month/year)* 07 October 2004 (07.10.2004)	Priority date *(day/month/year)* 08 October 2003 (08.10.2003)	

International Patent Classification (IPC) or national classification and IPC

IPC: G06F 17/30(2006.01)
USPC: 707/3,102,104.1

Applicant

UNISYS CORPORATION

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of ___ sheets, including this cover sheet.

☑ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of ___ sheets.

3. This report contains indications relating to the following items:

I ☒ Basis of the report

II ☐ Priority

III ☐ Non-establishment of report with regard to novelty, inventive step and industrial applicability

IV ☐ Lack of unity of invention

V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

VI ☐ Certain documents cited

VII ☐ Certain defects in the international application

VIII ☐ Certain observations on the international application

Date of submission of the demand 06 May 2005 (06.05.2005)	Date of completion of this report 10 March 2006 (10.03.2006)
Name and mailing address of the IPEA/US Mail Stop PCT, Attn: IPEA/ US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer *Kuan Vuon* CHARLES RONES Telephone No. (571) 272-3609

Form PCT/IPEA/409 (cover sheet)(July 1998)

I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed.

☒ the description:
pages 1-66 as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____ .

☒ the claims:
pages 67-68 , as originally filed
pages NONE , as amended (together with any statement) under Article 19
pages NONE , filed with the demand
pages NONE , filed with the letter of _____ .

☒ the drawings:
pages 1-15 , as originally filed
pages 1-15 , filed with the demand
pages 1-15 , filed with the letter of 06 May 2005 (06.05.2005) _____ .

☐ the sequence listing part of the description:
pages NONE , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____ .

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination(under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages NONE

☐ the claims, Nos. NONE

☐ the drawings, sheets/fig NONE

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*
** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*
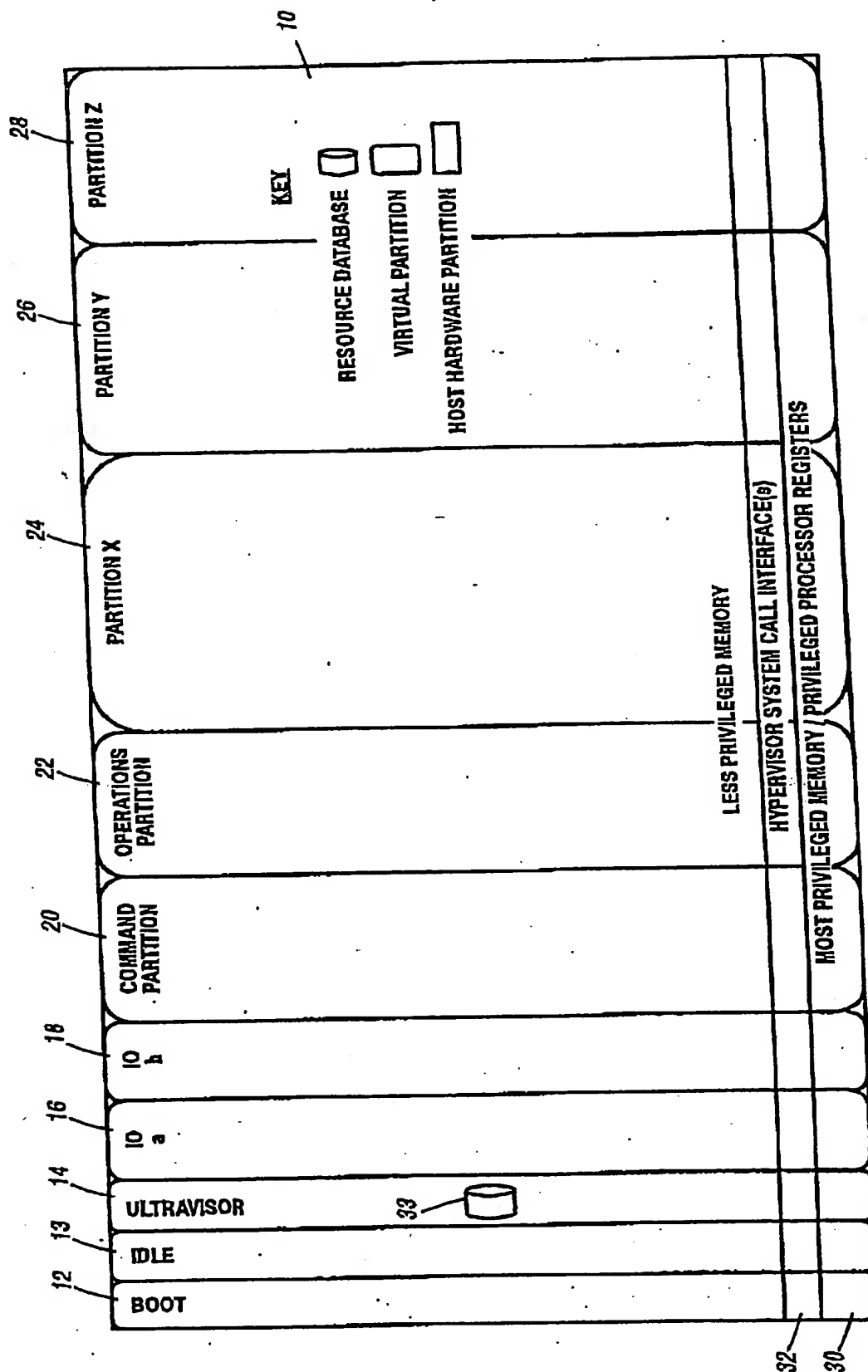
V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. STATEMENT

Novelty (N)	Claims	1-6	YES
	Claims	NONE	NO
Inventive Step (IS)	Claims	1-6	YES
	Claims	NONE	NO
Industrial Applicability (IA)	Claims	1-6	YES
	Claims	NONE	NO

2. CITATIONS AND EXPLANATIONS

Claims 1-6 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest memory allocation page map is organized according to a tiered page size model including a hierarchy of scales using 2^x as a scaling factor whereby an index page at each tiered page size level may allocate 2^x memory blocks at a size of the next lower tiered page size level.
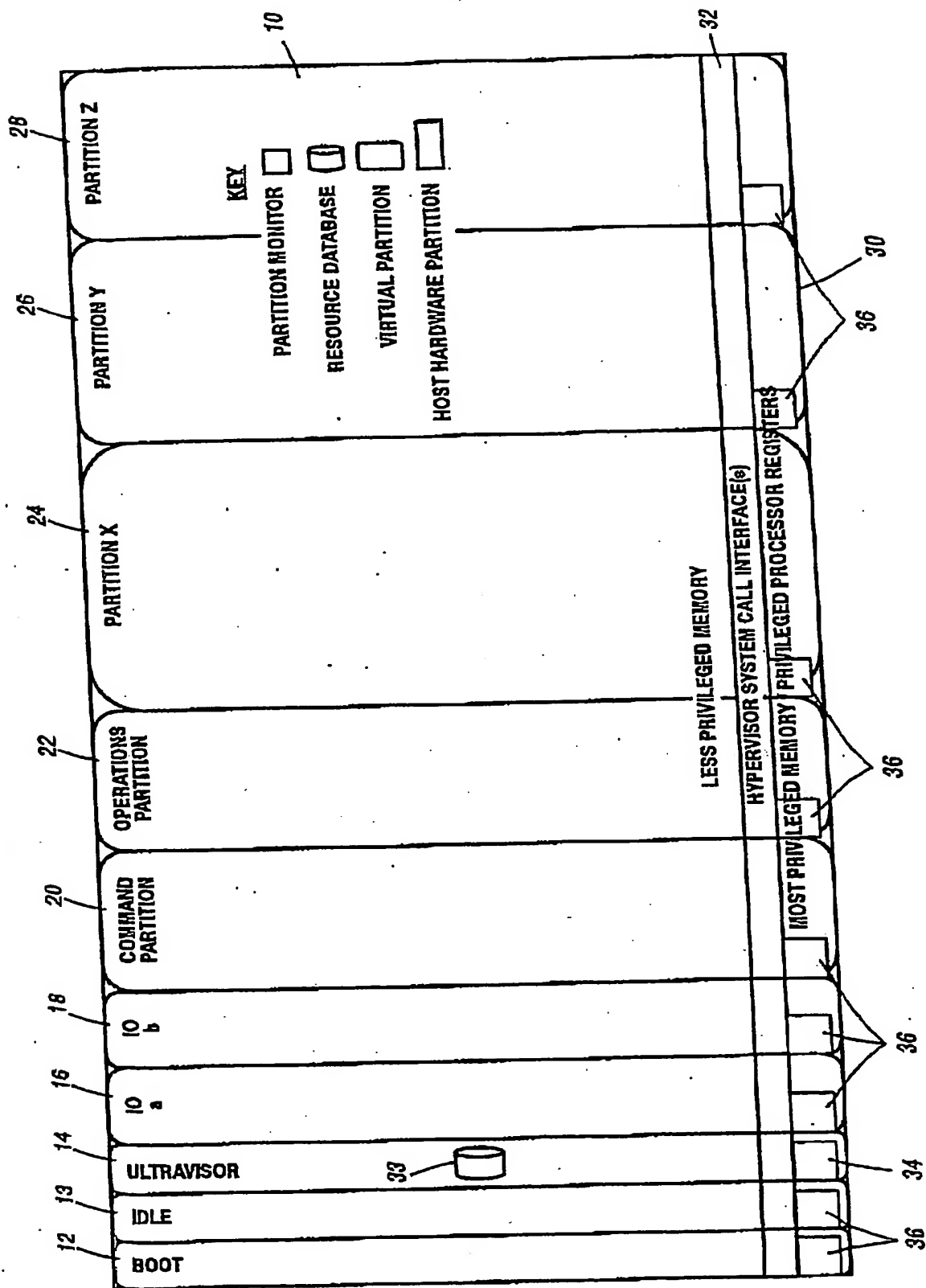
------------------ NEW CITATIONS ------------------
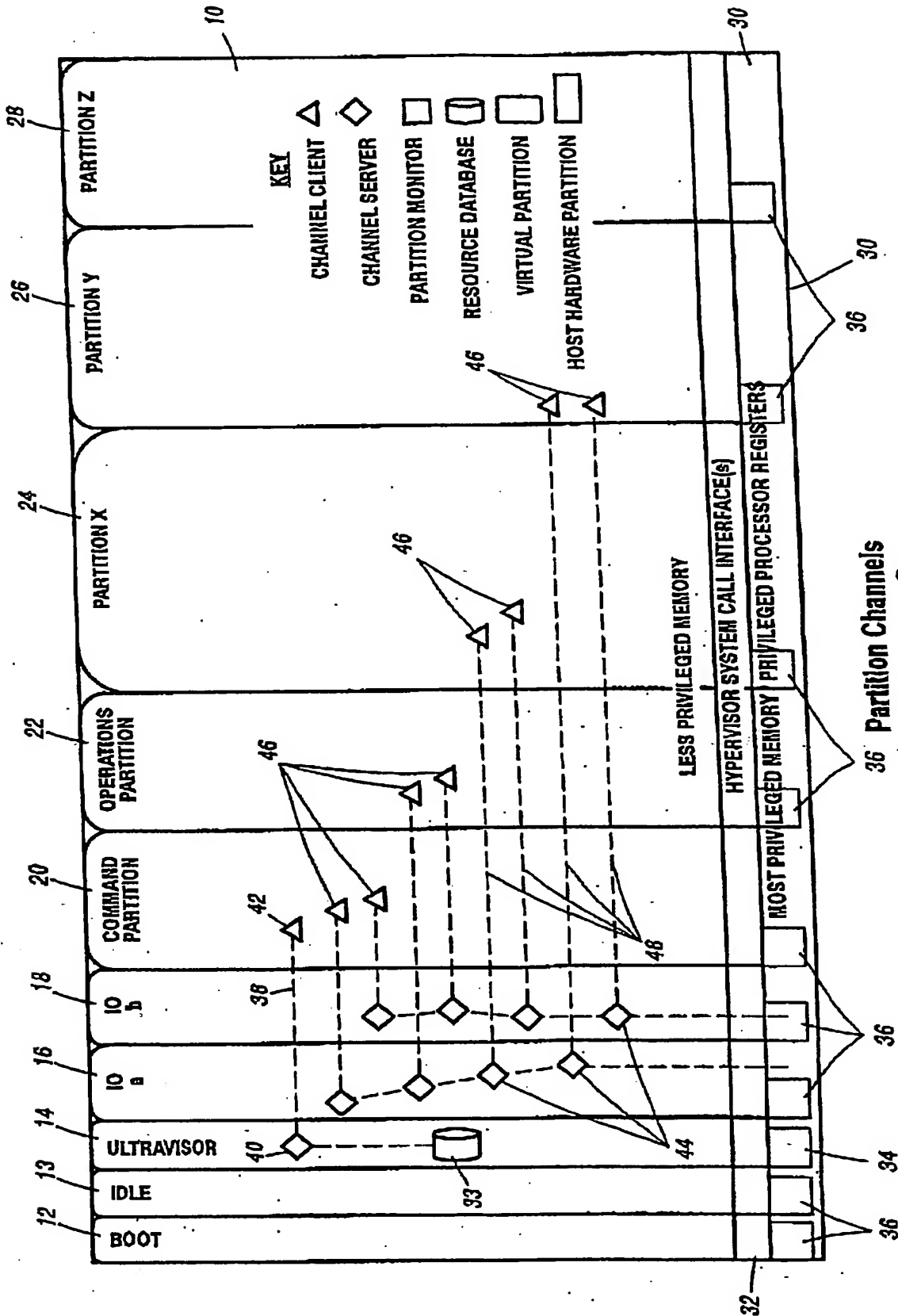
KEY

RESOURCE DATABASE

VIRTUAL PARTITION

HOST HARDWARE PARTITION

28 PARTITION Z

26 PARTITION Y

24 PARTITION X

22 OPERATIONS PARTITION

20 COMMAND PARTITION

18 IO h

16 IO a

14 ULTRAVISOR

13 IDLE

12 BOOT

10

33

LESS PRIVILEGED MEMORY

HYPERVISOR SYSTEM CALL INTERFACE(s)

HOST PRIVILEGED MEMORY / PRIVILEGED PROCESSOR REGISTERS

32

30

Partitioned Host System

Figure 1

Partition Monitors

Figure 2

KEY

△ CHANNEL CLIENT

◇ CHANNEL SERVER

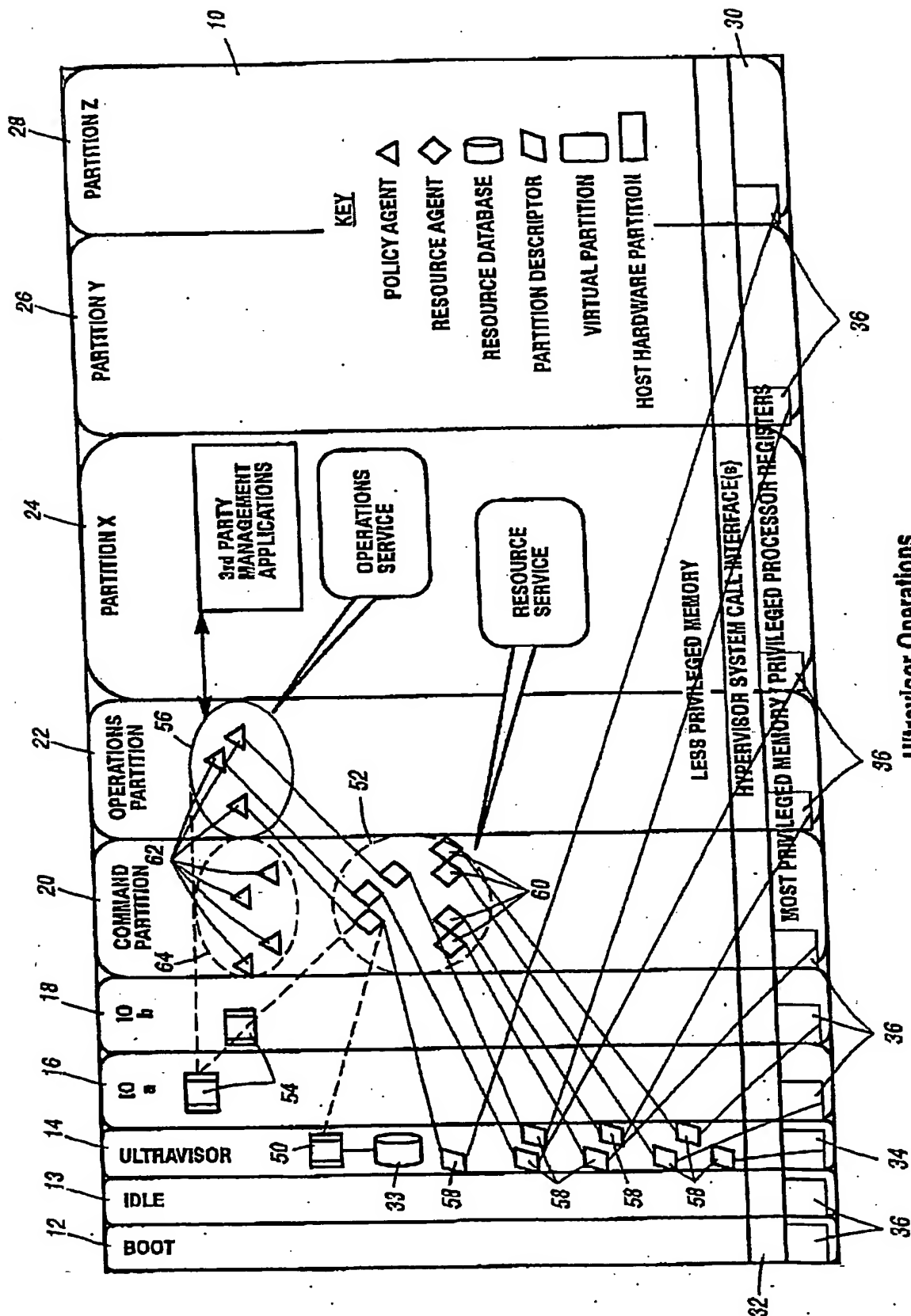☐ PARTITION MONITOR

⬚ RESOURCE DATABASE

☐ VIRTUAL PARTITION

☐ HOST HARDWARE PARTITION

Partition Channels

Figure 3

Ultravisor Operations

Figure 4

OVERLAPPED PROCESSOR THROTTLING – DEFAULT 4 BIT DUTY WIDTH (1/16 = 6.25%)

50%
WIDTH 8
OFFSET 0 — 8

25%
WIDTH 4
OFFSET 8 — 4

25%
WIDTH 4
OFFSET 12 — 4
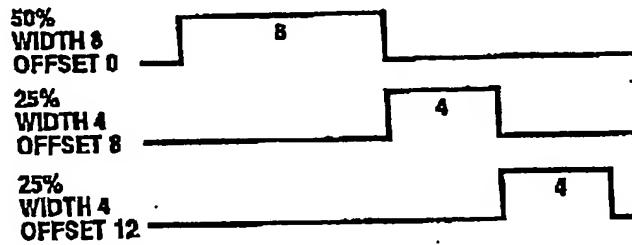
Processor Sharing

Figure 5

TIME
QUANTUM

10a

COMMAND

GUEST

GUEST

GUEST

OPERATIONS

GUEST

GUEST

GUEST

GUEST

10b

GUEST

GUEST

GUEST

GUEST

0   4   8   12   15
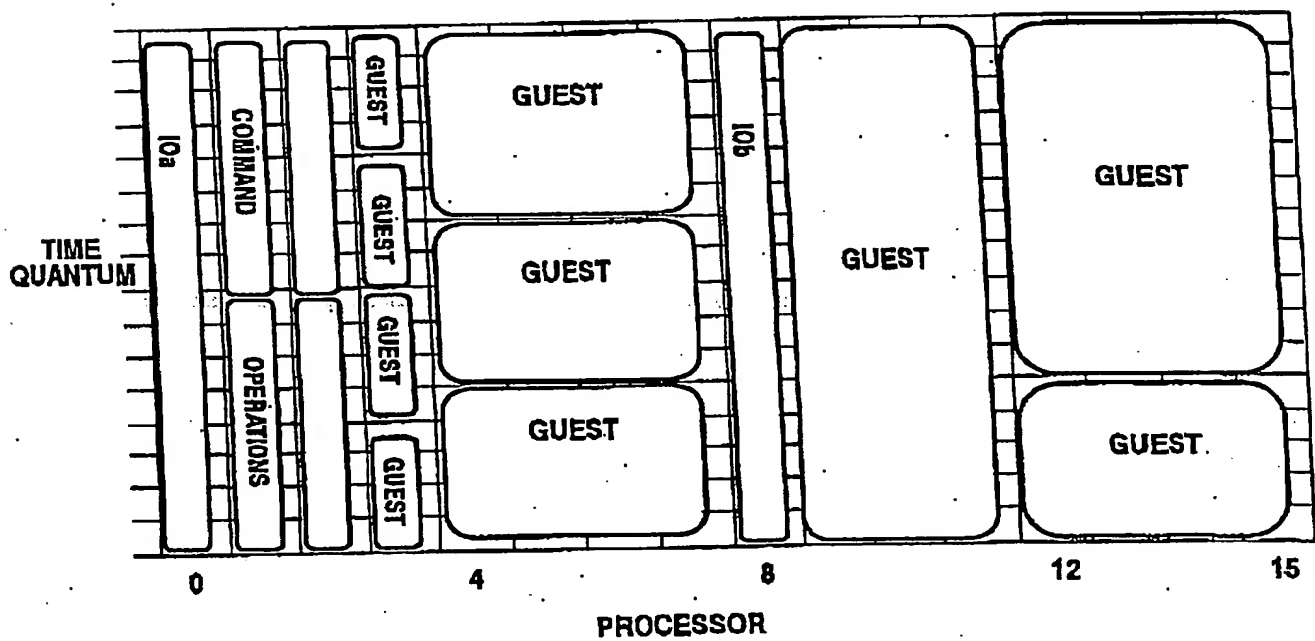
PROCESSOR

Processor Schedule

Figure 6

AMENDED SHEET

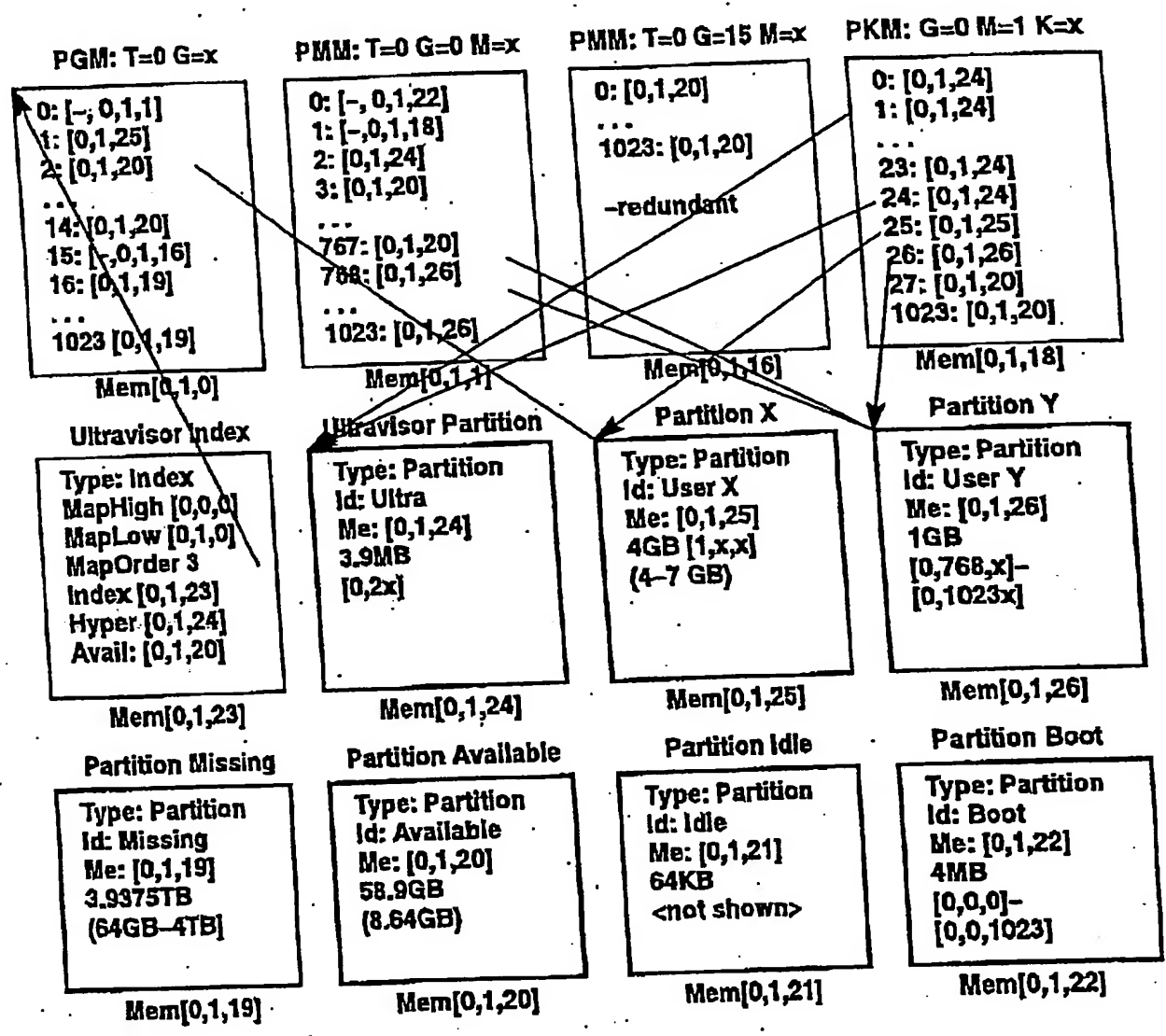| $(2^{10})^n$	SI Prefix	SI Name	Page Table	Pageantry	IA32/EM32T
1	K	kilo	PKM	PKE	PT/PTE
2	M	mega	PMM	PME	PD/PDE
3	G	giga	PGM	PGE	PDP
4	T	tera	PTM	PTE	PML4
5	P	peta	PPM	PPE	
6	E	Exa	PEM	PEE	
7	Z	zetta	PZM	PZE	
8	Y	yotta	PYM	PYE	

SI Prefixes for Page Table Hierarchy

Figure 7

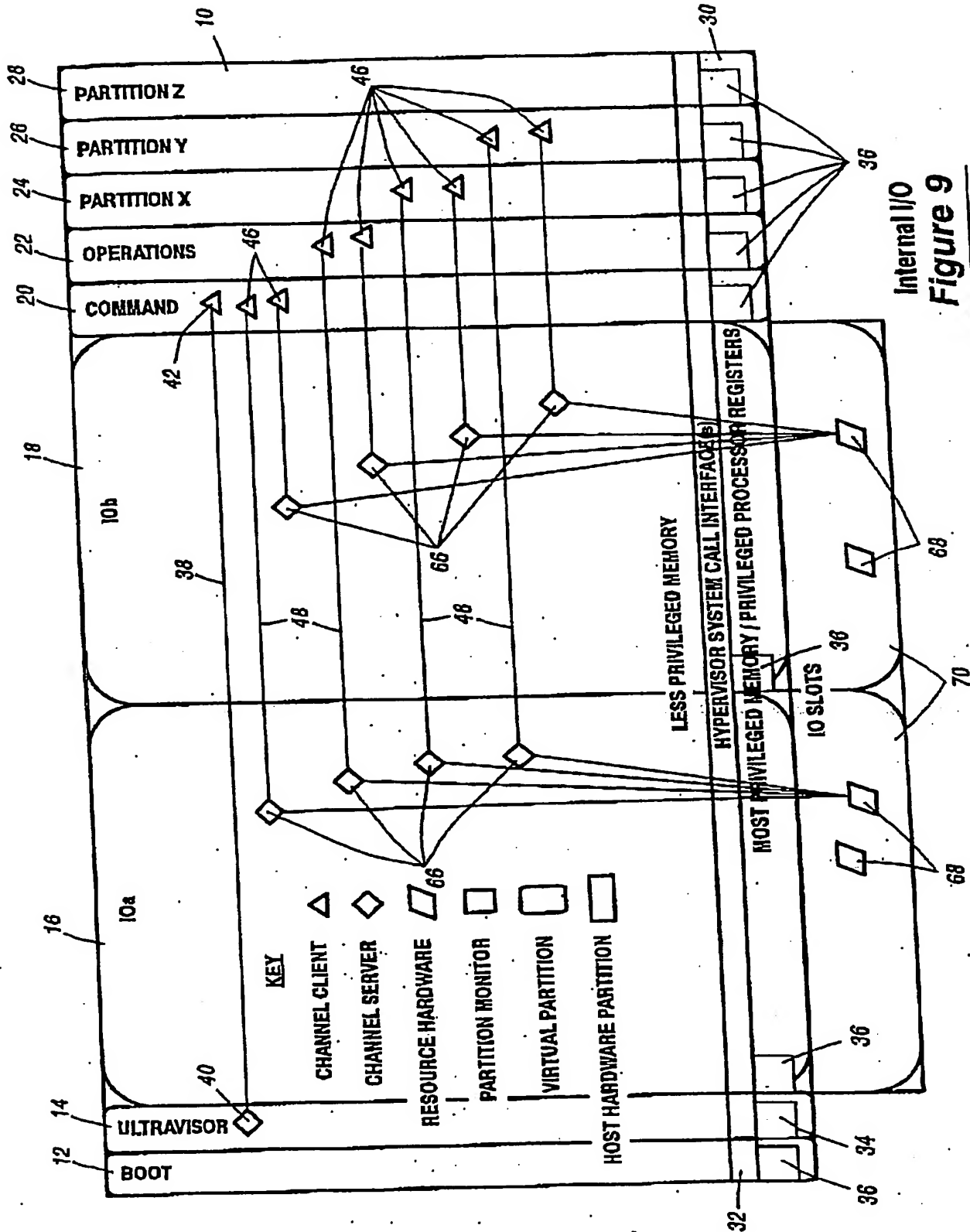Function GetMemoryOwner [T : 0..1023, G:0..1023, M:0..1023, K:0..1023] of Int32

Memory Index Ref	1		GB	MB	KB

Partition number (32 bits)	O	S	Node (GB)	MB	KB

PGM: T=0 G=x

0: [–, 0,1,1]
1: [0,1,25]
2: [0,1,20]
...
14: [0,1,20]
15: [–,0,1,16]
16: [0,1,19]
...
1023 [0,1,19]

Mem[0,1,0]

PMM: T=0 G=0 M=x

0: [–, 0,1,22]
1: [–,0,1,18]
2: [0,1,24]
3: [0,1,20]
...
767: [0,1,20]
768: [0,1,26]
...
1023: [0,1,26]

Mem[0,1,1]

PMM: T=0 G=15 M=x

0: [0,1,20]
...
1023: [0,1,20]

–redundant

Mem[0,1,16]

PKM: G=0 M=1 K=x

0: [0,1,24]
1: [0,1,24]
...
23: [0,1,24]
24: [0,1,24]
25: [0,1,25]
26: [0,1,26]
27: [0,1,20]
1023: [0,1,20]

Mem[0,1,18]

Ultravisor Index

Type: Index
MapHigh [0,0,0]
MapLow [0,1,0]
MapOrder 3
Index [0,1,23]
Hyper [0,1,24]
Avail: [0,1,20]

Mem[0,1,23]

Ultravisor Partition

Type: Partition
Id: Ultra
Me: [0,1,24]
3.9MB
[0,2x]

Mem[0,1,24]

Partition X

Type: Partition
Id: User X
Me: [0,1,25]
4GB [1,x,x]
(4–7 GB)

Mem[0,1,25]

Partition Y

Type: Partition
Id: User Y
Me: [0,1,26]
1GB
[0,768,x]–
[0,1023x]

Mem[0,1,26]

Partition Missing

Type: Partition
Id: Missing
Me: [0,1,19]
3.9375TB
(64GB–4TB]

Mem[0,1,19]

Partition Available

Type: Partition
Id: Available
Me: [0,1,20]
58.9GB
(8.64GB)

Mem[0,1,20]

Partition Idle

Type: Partition
Id: Idle
Me: [0,1,21]
64KB
<not shown>

Mem[0,1,21]

Partition Boot

Type: Partition
Id: Boot
Me: [0,1,22]
4MB
[0,0,0]–
[0,0,1023]

Mem[0,1,22]

Where Mem[G,M,K] := ((G * 2**10+M) * 2**10 + K) * 2**10*2**2

Partition Memory Map

Figure 8

Internal I/O
Figure 9

KEY

△ CHANNEL CLIENT

◇ CHANNEL SERVER

▱ RESOURCE HARDWARE

▭ PARTITION MONITOR

▢ VIRTUAL PARTITION

▯ HOST HARDWARE PARTITION

Figure 10

External I/O

KEY

CHANNEL CLIENT
CHANNEL SERVER
RESOURCE HARDWARE
PARTITION MONITOR
VIRTUAL PARTITION
HOST HARDWARE PARTITION

PARTITION Z
PARTITION Y
PARTITION X
OPERATIONS
COMMAND

ULTRAVISOR
BOOT

LESS PRIVILEGED MEMORY
HYPERVISOR SYSTEM CALL INTERFACE(s)
HOST PRIVILEGED MEMORY / PRIVILEGED PROCESSOR REGISTERS
IO SLOTS

KEY

VIRTUAL PARTITION

PARTITION DOMAIN

PARTITION CLUSTER

HOST HARDWARE PARTITION

SYSTEM DOMAIN

TEST

PRODUCTION

MISSION CRITICAL

Ultravisor Domains

Figure 11

KEY

△ POLICY AGENT

◯ POLICY DOMAIN

◠ SYSTEM DOMAIN

◇ RESOURCE AGENT

◠ RESOURCE DOMAIN

▱ VIRTUAL PARTITION

▭ HOST HARDWARE PARTITION

↴ SERVICE CONNECTION
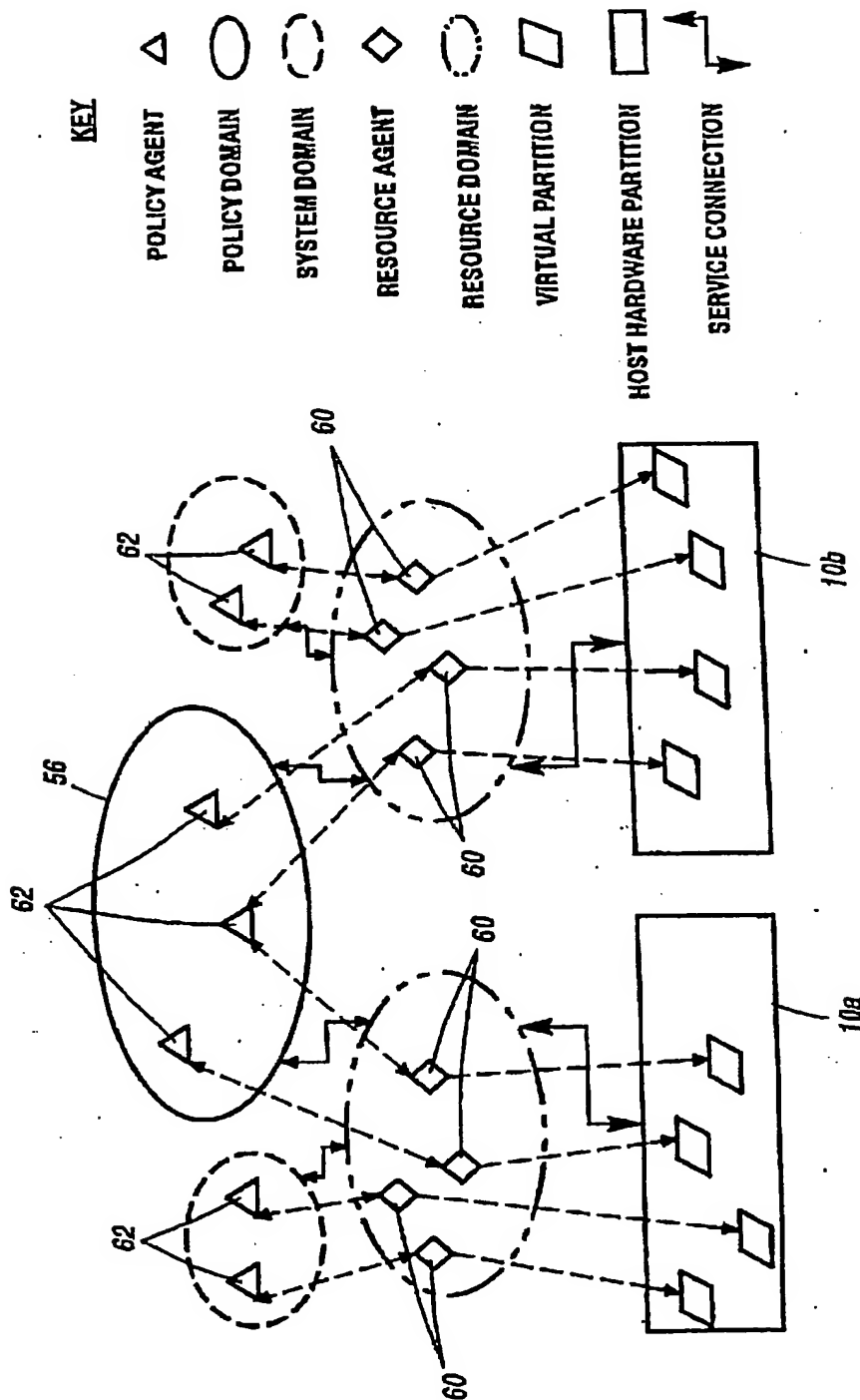
Ultravisor Partition Agents
Figure 12
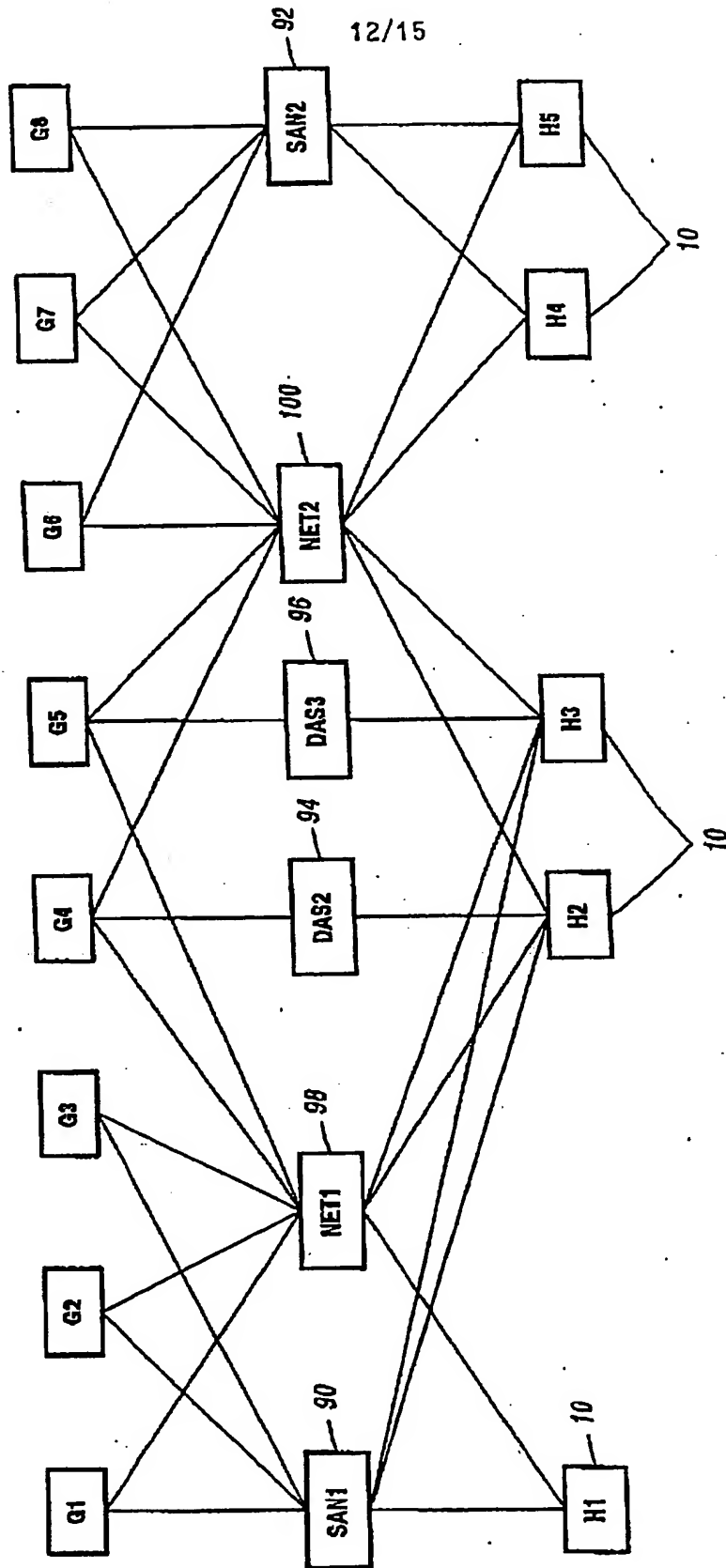
Virtual Data Center Zones

Figure 13
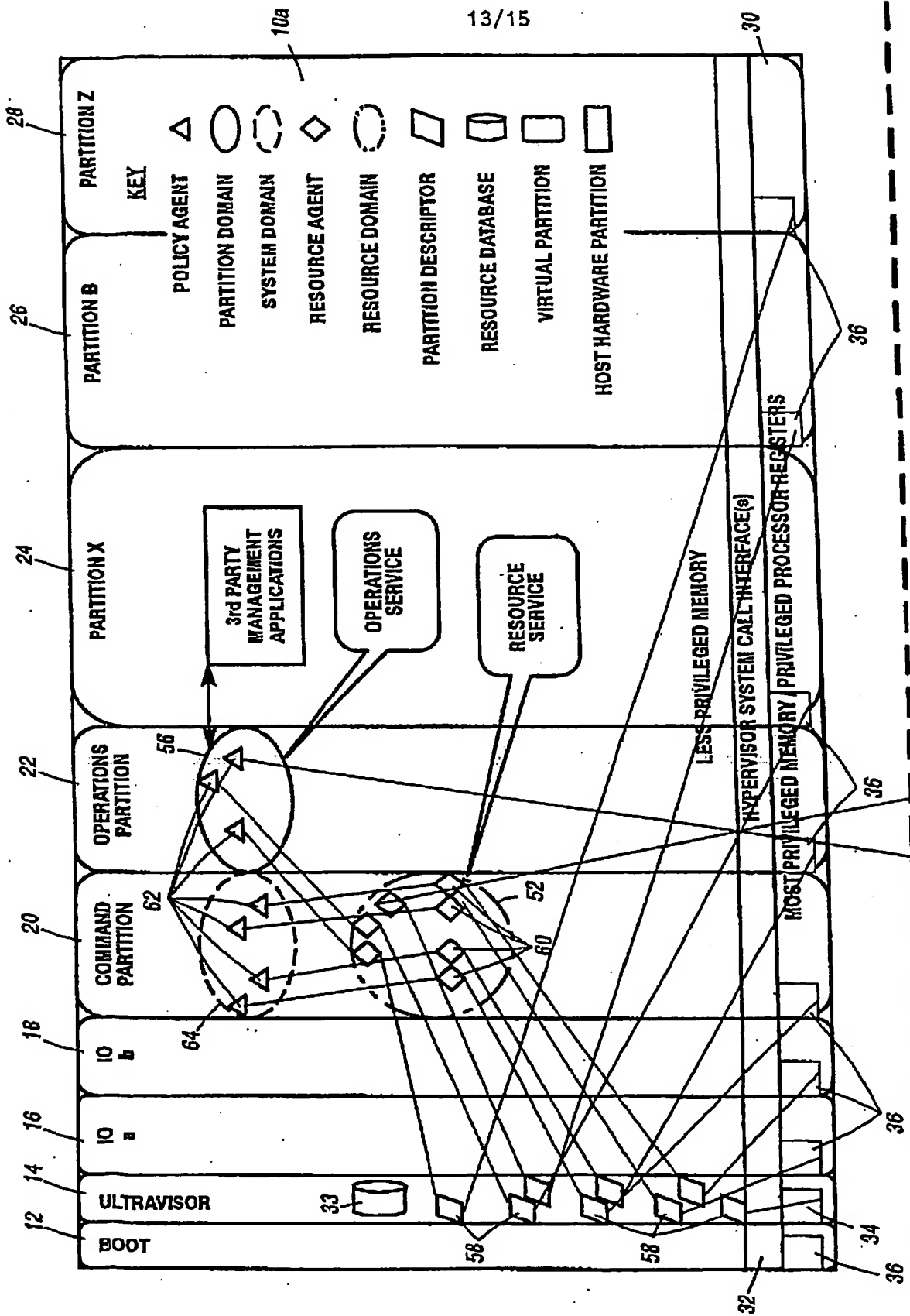
Data Center / Multiple Hosts

Figure 14A

Figure 14

Fig. 14A
Fig. 14B

Data Center / Multiple Hosts
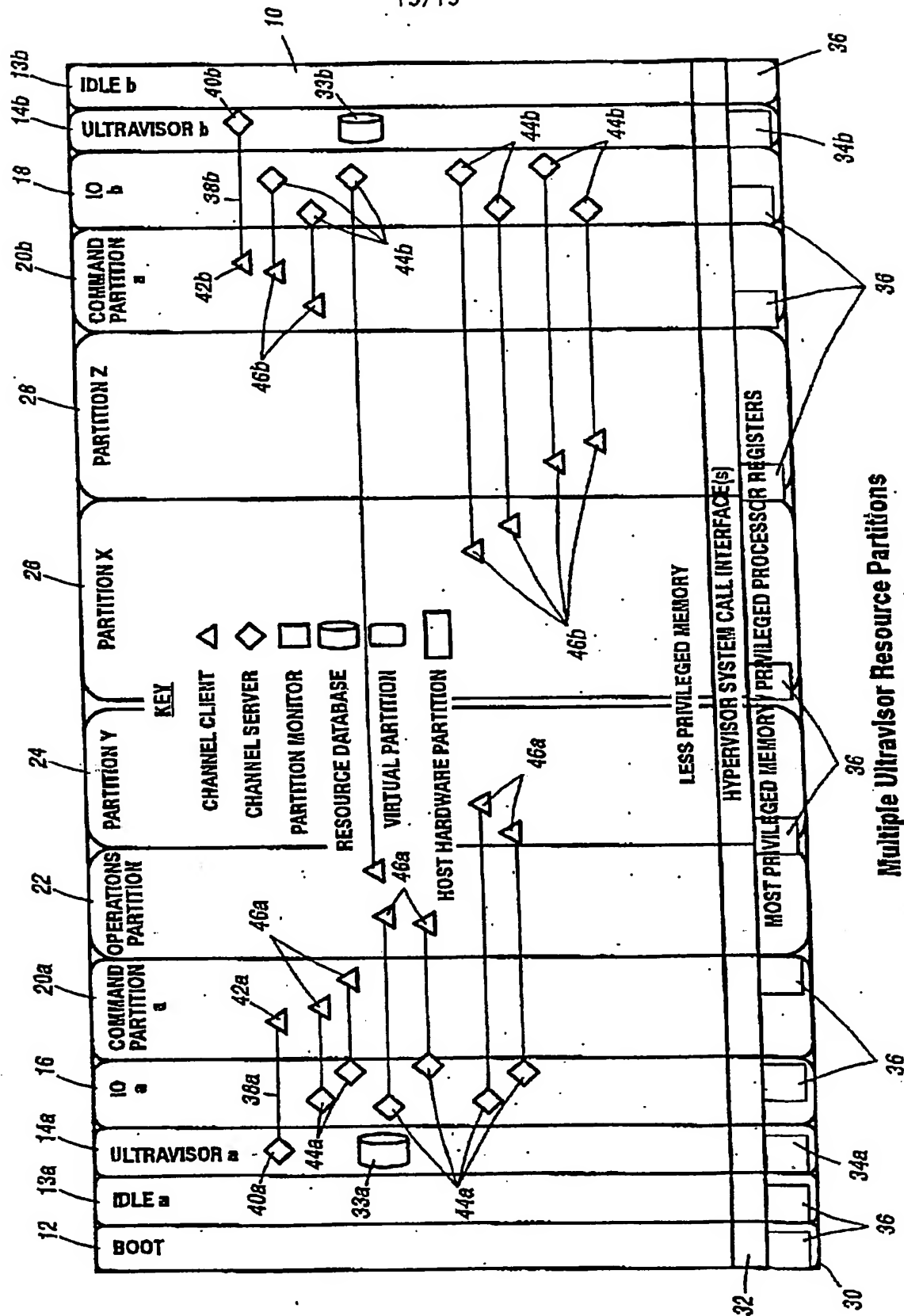
Figure 14B

Multiple Ultravisor Resource Partitions

Figure 15